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IN THE

Supreme Court of the United States

October Term, 1977.

No. 77-75

SYSTEMATIC TOOL & MACHINE COMPANY, et al.,

Petitioners,

v.

WALTER KIDDE & COMPANY, INC.,

Respondent.

PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT.

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Systematic Tool & Machine Company, et al.[1] (hereinafter referred to as "Petitioners") pray that a Writ of Certiorari issue to review the Judgment of the United States Court of Appeals for the Third Circuit entered in the above entitled civil action on March 25, 1977.

I.

OPINIONS BELOW.

The Opinion of the United States Court of Appeals for the Third Circuit (1a-21a)[2] has not as yet been reported.[3] The two Opinions of the United States District

1. Petitioners are Systematic Tool & Machine Company (a partnership) that was absorbed by a corporation Systematic, Inc. which was formed prior to institution of this suit on February 14, 1969. Other Petitioners are Clayton Giangiulio and Dominic D'Ambro, all of whom were Plaintiffs in the District Court and Appellees in the Court of Appeals.

2. Reference to the Appendix filed concurrently with this Petition is by page number, followed by the letter "a".

3. This includes the dissenting Opinion of Circuit Judge Rosenn.

Court for the Eastern District of Pennsylvania (25a-147a) are reported at 390 F. Supp. 178 and 409 F. Supp. 511 (E. D. Pa. 1975 and 1976).

II.

JURISDICTION.

The Opinion and Order of the United States Court of Appeals for the Third Circuit was entered on March 25, 1977. Petitioners filed a timely request for Rehearing In Banc at the Court of Appeals on April 7, 1977 (22a) which Petition was denied by the Court of Appeals on April 28, 1977 (23a). The twenty-one day pendency of the Petition for Rehearing In Banc before the Court of Appeals is to be added [4] to the ninety-day period allowed by 28 U. S. C. § 2101(c). See 9 Moore's Federal Practice § 201.03 [3.2]. The jurisdiction of this Court is invoked under 28 U. S. C. § 1254(1).

III.

QUESTIONS PRESENTED.

1. What is the role of Synergism in evaluating the validity of a patent with reference to the determination of non-obvious subject matter within the meaning of 35 U. S. C. 103?

2. Where the District Court twice found that the invention of the patent in suit achieved a synergistic result, was it proper for the Court of Appeals to relegate the findings of synergism to the status of merely one factor to consider in determining obviousness, which finding of synergism is outweighed by conclusionary partisan testimony of Respondent's expert that had been rejected by the District Court?

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4. *United States v. Adams*, 383 U. S. 39, 41 (1966).

IV.

CONSTITUTIONAL PROVISION AND STATUTE INVOLVED.

The constitutional provision involved is Article 1, Section 8, which reads as follows:

> "The Congress shall have the power . . . To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writing and discoveries."

The Statute involved is 35 U. S. C. § 103 which reads as follows:

> "A patent may not be obtained though the invention is not identically disclosed or described, as set forth in Section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

V.

STATEMENT OF THE CASE.

In 1969, Petitioners filed suit in the Northern District of Illinois against Respondent and others for infringement of Giangiulio Patent No. 3,369,582 (copy attached hereto) entitled "Tomato Slicer". On Motion of Respondent the suit was transferred to the Eastern District of Pennsylvania with the action against the others being stayed.

Respondent initially sold a first type of accused tomato slicing machine known as the TK-I machine, the sales of which ceased in 1968. Respondent has stipulated that the TK-I machine infringes Petitioners' Patent, if valid.

During the period of 1968 to 1972 Respondent sold a second type of tomato slicing machine which is known as the TK-II machine. Petitioners' tomato slicer is known as the "Tomato Tamer".

After a non-jury trial, the District Court rendered an Opinion dated February 21, 1975 (25a-126a) holding Petitioners' Patent to be valid and finding that the TK-II tomato slicer, as well as the TK-I tomato slicer, infringes upon Petitioners' Patent. The Order of the District Court of February 21, 1975 allowed Respondent to file exceptions, which in fact were filed. The District Court, in a second Opinion, dated March 19, 1976 (127a-147a) denied the Respondent's exceptions and affirmed and readopted the earlier Findings of Fact and Conclusions of Law relating to validity and infringement of Petitioners' Patent. The District Court entered another Order on April 28, 1976 denying without prejudice, Injunctive Relief, in view of Respondent's cessation of infringing activities in 1972.

Of particular interest is the fact that the District Court twice found (74a, 76a) that Petitioners' invention had

achieved a *synergistic result*. This is significant not only because of what the District Court found, but also because of the timing, namely, the District Court's finding of *synergism* are to be found in an Opinion, dated February 21, 1975 which *predates* this Court's substantive reliance on synergism in *Sakraida v. Ag Pro, Inc.*, 425 U. S. 273, 79 S. Ct. 1532, 1537 (1976).

The Court of Appeals for the Third Circuit (1a-21a), in a 2-1 decision reversed[5] the District Court on the ground that the subject matter of Petitioners' patent and the prior art is obvious under 35 U. S. C. 103. The Court of Appeals based its reversal entirely on the testimony of Respondent's expert witness, which expert testimony had been *expressly rejected* by the District Court. The Court of Appeals not only placed overwhelming reliance on the testimony of Respondent's expert witness, but concluded that such testimony superseded the careful analysis of the prior art by the District Court.

The Court of Appeals added insult to injury by relegating the District Court's holdings of *synergistic* result (16a) to the junior status of one factor to consider in determining obviousness.

The net result of the analysis of the Court of Appeals is that it concluded that the testimony of Respondent's partisan expert outweighed not only the District Court's findings of synergism, but also the secondary tests of validity set forth by this Court in *Graham v. John Deere Co.*, 318 U. S. 1 (1966). The District Court found as facts that the patented invention enjoyed substantial commercial success, filled a long-felt need, failure of others and copying. A Petition for Rehearing In Banc was denied.

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5. Circuit Judge Rosenn filed a dissenting opinion (16a-21a) on the ground that the case should be remanded to the District Court for further findings with reference to the level of ordinary skill in the art.

It is thus seen that every *objective standard* set forth by this Court in determining validity has been met by the invention covered by the patent in suit. However, the Court of Appeals has chosen to virtually disregard the findings of fact concerning these standards, and instead has set as its standard of validity the subjective test of the opinion of a paid partisan expert.

VI.

REASONS FOR GRANTING THE WRIT.

1. The District Court's Finding of Synergism Creates a Strong Presumption of Non-Obviousness Under 35 U. S. C. 103.

This case should be reviewed on Certiorari because it involves important questions of national interest with reference to the meaning of Article 1, Section 8 of the Constitution which empowers Congress to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

The historic starting point for an analysis of the law of patent validity is *Hotchkiss v. Greenwood*, 11 How. 248, 267 (1851) which establishes the legal test of patent validity as requiring ingenuity and skill beyond that possessed of an ordinary mechanic acquainted with the business.

The foregoing test was refined in *A & P Co. v. Super Market Corp.*, 340 U. S. 147, 152 (1950) wherein this Court stated:

> "Courts should scrutinize combination patent claims with a care proportioned to the difficulty and improbability of finding invention in an assembly of old elements . . . A patent for a combination which only unites old elements with no change in their respective functions . . . obviously withdraws what already is known into the field of its monopoly and diminishes the resources available to skillful men . . ."

In 1952 Congress enacted the present patent statute (Title 35, United States Code) and for the first time included in the patent statutes a test of patent validity in

Section 103 which was explained in *Graham v. John Deere Co.*, 383 U. S. 1, 17 (1966):

> "Under 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved."

Graham v. John Deere Co., supra, also set forth the significance of the secondary tests as follows at 383 U. S. 694.

> "Against this background, the obviousness or non-obviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy."

The most recent interpretation of 35 U. S. C. 103 by this Court is to be found in *Sakraida v. Ag Pro, Inc.*, 425 U. S. 273 (1976). In *Sakraida* the District Court had held the patent invalid, but the Court of Appeals reversed on the ground that the patented invention achieved a *synergistic* result. This Court however reversed the judgment of the Court of Appeals and reinstated the invalidity judgment of the District Court by holding at 96 S. Ct. 1537:

> "We cannot agree that the combination of these old elements to produce an abrupt release of water directly on the barn floor from storage tanks or pools can properly be characterized as synergistic, that is, result [ing] in an effect greater than sum of the several effects taken separately."

In the case at bar the Court of Appeals accepted the finding of the District Court as to the existence of a synergistic result and even deemed Petitioners' invention to be a "synergistic combination of known elements".[6] However, the Court of Appeals relegated synergism in the case at bar as being simply one factor to consider in determining obviousness. In *Sakraida* this Court defined synergistic as resulting in an effect greater than the sum of the several effects taken separately. As such, a *synergistic* result or *synergistic* combination at least gives rise to a *strong presumption* of non-obviousness.

Stated another way, the bringing together of a combination of old elements to achieve a synergistic result which is greater than the sum of the individual components by themselves, strongly suggests non-obviousness, particularly, as in the case at bar, when there are the secondary factors of commercial success, filling a long-felt need, failure of others and copying.

2. Petitioners' Invention and the Synergistic Result.

Since Thomas Jefferson first popularized the eating of tomatoes, the prevalent practice has been to slice tomatoes using an ordinary knife. The myriad of vegetable and fruit slicers for apples, potatoes, onions and lettuce, simply do not satisfactorily perform the task of slicing tomatoes.

As noted by the District Court in Finding No. 11 (38a) tomatoes possess the peculiar feature of a very tough outer skin and a soft, virtually structureless interior which contrasts sharply with food such as onions or apples. The special and unique properties of tomatoes are specifically recited in Columns 1 and 4 of Petitioners' patent (attached to this brief).

As further noted by the District Court (39a) typical existing slicing machines force the blades through the fruit with pressure build-up occurring in the tomato and then

6. 16a.

explode the tomato or shred the skin. Further pressure on a damaged tomato would squash it.

However, Petitioners' invention is not only the first successful tomato slicer, but it enables tomato slicing to occur at *high production rates* which constitutes the synergistic result of the invention.

In particular, the Petitioners' invention effects a movement of the tomato through blades at an angle of less than 40°, with the angle between the leading pusher arm (which holds the tomato) and the cutting edge of the blades being less than 90° and the trailing arm angle being a small acute angle. These features can be observed in Figure 1 of Petitioners' patent with particular emphasis on one arm 34a which is generally perpendicular to blades 24 and the other arm 34a that extends generally in the same direction as the blades 24. It is the combination of the movement of the tomato through blades 24a at an angle of less than 40° and different forcing actions of the arms 34a which "insures that the tomato is fully pushed through the blades to the other side" (column 4, line 70 of the patent).

By virtue of the foregoing combination (not found in the prior art) Petitioner's invention achieves the *synergistic* result of slicing tomatoes at a rate at least ten times greater than the prior art.

The foregoing synergistic result is absolutely confirmed by *Respondent's* own trade literature (copy of which is attached to this Brief), as well as the testimony of the inventor (7a). With reference to Respondent's trade literature, Respondent claims "slices whole tomatoes perfectly in one second". This constitutes a production rate of sixty sliced tomatoes per minute as compared with a rate of six tomatoes per minute for the only prior art patent in the record which is intended to slice tomatoes. The Court of Appeals did not even expressly cite this patent (Birambeau), but rather made an oblique reference to a

bun slicing patent (Bever) and to a general food slicing patent (Curtis).[7]

Moreover, the Court of Appeals simply ignored the District Court's findings as to the secondary factors, such as commercial success, filling a long-felt need, failure of others and copying. Instead, the Court of Appeals relegated the pronounced *synergism* of Petitioners' invention to the realm of "one factor considered in determining obviousness".[8]

It is respectfully submitted that synergism is entitled to substantial weight in determining non-obviousness under 35 U. S. C. 103, particularly when the secondary tests of commercial success, filling a long-felt need, failure of others and copying are present.

In this connection attention is called to the reasoning in *International Telephone and Telegraph Corporation v. Raychem Corporation*, 538 F. 2d 453 (1st Cir. 1976); Cert. denied 97 S. Ct. 238 (1976) wherein the First Circuit applied the rule of the *Sakraida* case in affirming a holding of patent validity and stated at 538 F. 2d 457:

> "Based on the district court's findings of fact, we hold that the invention claimed patentable under this standard. The Court found that the temperature rating of a wire insulation was 'unpredictably high' as compared with the temperature rating of its components. Also, as noted above, the wired insulation was unexpectedly flame resistant. Thus, the findings established a sufficient 'synergistic' effect between the materials in the new combination, to cross the legal border line from a combination which produces a 'more striking result' to one which constitutes a patentable invention. See Sakraida v. Ag Pro, Inc., supra. 96 S. Ct. 1532."

7. 16a.
8. 16a.

Similarly, in the case at bar the *tenfold* increase in production of a tomato slicer is easily a sufficient *synergistic* effect to cross the legal border line from a combination which produces a more striking result to one which constitutes a patentable invention.

This Petition for Certiorari should be granted so that the Court can fix the place of synergism as a guide in deciding non-obviousness under 35 U. S. C. 103, namely, as something more than one factor to be considered. Synergism is the essence of unobviousness. As defined by this Court in *Sakraida,* synergism is an effect greater than the sum of the several effects taken separately.

Where synergism is present there is necessarily a sufficient probability of "unobviousness" that the secondary factors of commercial success, filling a long-felt need, copying and failure of others should come into play in accordance with the rule of *Graham v. John Deere Co., supra,* and *United States v. Adams,* 383 U. S. 39 (1966).

In this connection, in the *Adams* case, the Court stated at 383 U. S. 52:

> "Nor are these the only factors bearing on the question of obviousness. We have seen that at the time Adams perfected his invention noted experts expressed disbelief in it. Several of the same experts subsequently recognized the significance of the Adams invention, some even patenting improvements on the same system."

This case should be reviewed on Certiorari to announce the rule that where there is a *synergistic* combination or *synergistic* result then there is a presumption of non-obviousness under 35 U. S. C. 103. This allows for the consideration of the presence or absence of the secondary considerations, such as commercial success, filling

a long-felt need, failure of others and copying within the rule of *Graham v. John Deere, supra.*

3. The Court of Appeals Improperly Determined That the District Court's Findings of Synergism Are Outweighed by the Conclusionary Partisan Testimony of Respondent's Expert That Had Been Rejected by the District Court.

The District Court found (74a):

> "The prior art is reflected in a variety of slicers and choppers, each designed to deal with the specific problems which are peculiar to a variety of individual foods and to perform different tasks in connection with the cutting or slicing of particular foodstuffs. While it is true that the individual components and elements are well known in the prior art, *there is a synergistic result obtained through particular relationships among them.*" (Emphasis added.)

The District Court further found (76a):

> "(2) while diverse elements of food slicers are well known in the art, it is the *synergistic result* of arranging these elements in a specific manner that is significant in the issuance of a patent for the invention;" (Emphasis added.)

The reversal by the Court of Appeals is bottomed solely on the testimony of Respondent's engineering witness, Mr. Karr. The majority of the Court of Appeals at three separate places (8a, 15a, 16a) characterizes Mr. Karr's testimony as uncontradicted and then specifically relies on such testimony (15a) in order to reverse the District Court.

This is contrary to what the District Court itself had found (77a):

> "We have heard the evidence of defendant's expert engineering witness. We understand his testimony to mean that slicers are interesting developments of known technology and that, while a particular slicer may be an extremely efficient, and well-designed piece of machinery, there is no invention in putting a slicer together. However, *in light of the prior art*, and of our determination of the ordinary level skill in the art, we disagree with his opinion as to the obviousness of the '582 patent." (Emphasis added.)

From the foregoing it can be seen that the District Court rejected the testimony of Respondent's expert not only because of its determination of the ordinary skill in the art, but also because of *the prior art*.

The Third Circuit then improperly held that if the District Court had applied the proper standard of skill that it would have had only the uncontradicted expert testimony of Mr. Karr to determine the question of "obviousness" with respect to such persons (15a).

In making the foregoing statement, the Court of Appeals completely ignored the other evidence as to unobviousness in the record. Such other evidence included the inadequacy of the prior art (which is readily understandable without expert assistance) as well as the secondary factors, such as commercial success, filling a long-felt need, failure of others and copying.

The most serious error of the Court of Appeals is in relying upon expert testimony that was expressly rejected by the District Court as set forth on this page. This is contrary to the Third Circuit's own rule that the trier of fact is not bound to accept expert opinion, even if it is uncontradicted. See *Minnesota Mining and Manufacturing Company v. Berwick Industries, Inc.*, 532 F. 2d 330, 333 (3rd Cir. 1976); *Huddell v. Levin*, 537 F. 2d 726, 735, 736 (3rd Cir. 1976). See also footnote 4 at 537 F. 2d 736. Moreover, see *Universal Athletic Sales Co. v. American Gym, Recreational and Athletic Equipment Corporation, Inc.*, 546 F. 2d 530, 542 (footnote 39) (3rd Cir. 1976).

The case at bar is an outstanding example of the principle that the need for expert testimony and the reliance on such testimony is usually the sole province of the trier of fact.

Where the invention is of the understandable mechanical type, such as the present invention, the District Court has every right to make its own analysis of the prior art based on guidance from and arguments of counsel.

For purposes of this Appeal Petitioners accept the thesis of the Court of Appeals that the correct standard of ordinary skill in the art is that of a skilled machine designer. However, the present invention with its *synergism* is so clearly novel that it would be non-obvious to any skilled machine designer or any one else.

If the Court of Appeals Opinion is permitted to stand, future trials in patent cases will involve an ever-increasing number of confrontations between paid, partisan experts delivering predictable testimony. Such "fruitless confrontation of experts"[9] in most instances will be of little help to the trier of fact, but will rather make trials of patent cases as well as discovery longer, more complicated and more expensive. This is certainly contrary to the public interest.

The deepest concern is that non-obviousness under 35 U. S. C. 103 in a patent case should be decided on the *objective* factors relating to the validity of a patent, such as *synergism* and the content of the prior art, as well as

9. *Nashua Corporation v. RCA Corporation*, 431 F. 2d 220, 224 (1st Cir. 1970).

the secondary factors, including the solution of a long-felt need, commercial success, failure of others and copying. The Court of Appeals Opinion in this case tells the District Courts that they can disregard all of the foregoing and even disregard "synergism" while relying solely on the testimony of a partisan expert.

VII.

CONCLUSION.

The granting of this Petition for Writ of Certiorari will enable the Court to set the proper place of synergism in evaluating "non-obviousness" within the meaning of 35 U. S. C. 103. In particular, the District Court's finding of synergism will be given the vitality it deserves so as not to be swept away by partisan expert testimony that was rejected by the District Court.

Moreover, this case presents a rare opportunity for the Court to review a meritorious invention which has been commercialized by individuals and a small corporation. As such, the present suit is free of the anti trust, patent misuse and patent fraud considerations that are so widely prevalent today.

Indeed, Petitioners' invention presents the ideal case of an individual making an invention when there simply was nothing available to perform the task at low cost. Petitioners' invention led to the building of a small business, while filling the needs of the public. This is a very important accomplishment which was in part encouraged by the prospect of a grant of a valid patent.

The District Court in thoughtful Opinions twice confirmed this. The Court of Appeals upset these opinions solely through the elevation of partisan expert testimony which had been rejected by the District Court.

The review of this case on Certiorari will afford this Court the opportunity to clarify the law regarding *synergism* as well as correcting the serious injustice of the Opinion of the Court of Appeals.

Respectfully submitted,

ALAN H. BERNSTEIN,
Attorney for Petitioners.

Dated: July 13, 1977.

Feb. 20, 1968 C. E. GIANGIULIO 3,369,582

TOMATO SLICER

Filed May 4, 1967

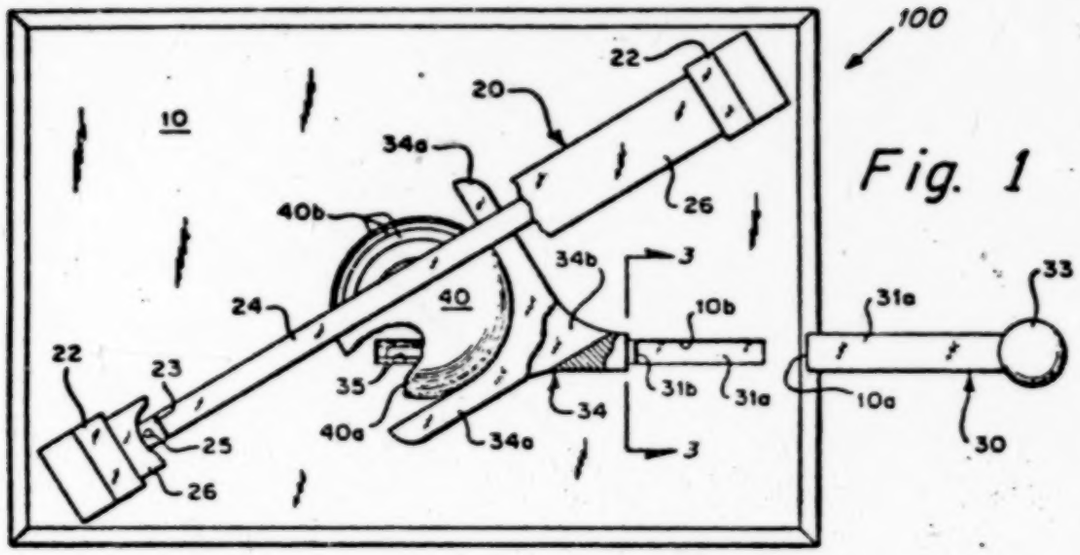

Fig. 1

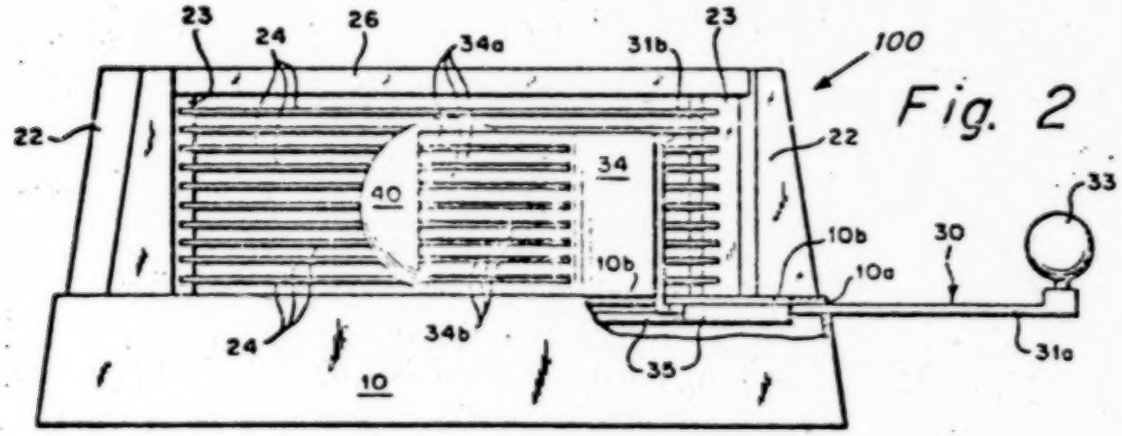

Fig. 2

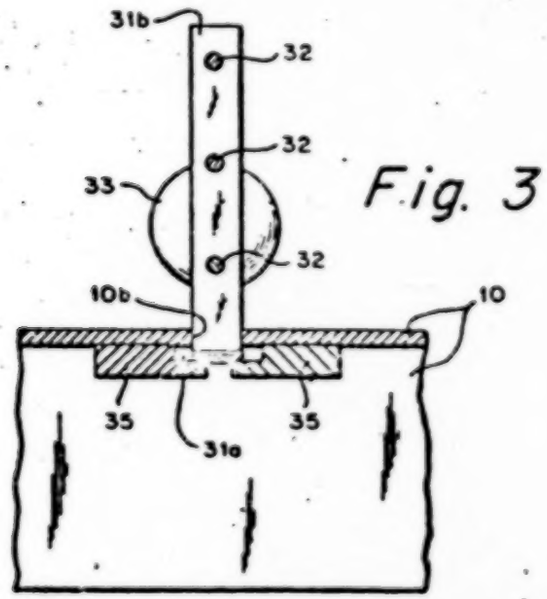

Fig. 3

INVENTOR.
CLAYTON E. GIANGIULIO
BY Paul Maleson
ATTORNEY

United States Patent Office

3,369,582
Patented Feb. 20, 1968

1

3,369,582
TOMATO SLICER
Clayton E. Giangiulio, Skyline Drive, R.D. 2, Malvern, Pa. 19355
Filed May 4, 1967, Ser. No. 636,176
9 Claims. (Cl. 146—169)

ABSTRACT OF THE DISCLOSURE

An apparatus adapted to slice soft fruit and vegetables and tomatoes in particular. A slidable pusher has a pocket to hold the fruit or vegetables and a number of slots to pass through the blades. A number of thin non-serrated blades are set at or near a preferred angle to the direction of motion of the pusher, and the pusher pocket has sides which intersect the blades within preferred angular limits.

Background of the invention

Slicing machines for many types of food products are of course very well known. Some of these are single bladed, usually using a revolving wheel, and others are multi-bladed. While many food products are easily cut with existing apparatus, the physical characteristics of tomatoes have made it difficult to simultaneously slice a tomato into slices for sandwich use. There is a tendency to crush and mangle the tomato. Much prior apparatus exists which in its rough and general appearance and structure is similar to that of the present invention.

Invention summary

It is an object of this invention to provide a fruit slicing apparatus.

It is another object of this invention to provide a multi-bladed apparatus for slicing soft fruit and vegetables, particularly tomatoes.

It is another object of this invention to provide a slicing apparatus having a pusher, with the pusher comprising a pocket to receive the object to be sliced, and the pocket having arms extending therefrom. The pusher coacts with an array of thin non-serrated blades. The blades are set at an angle to the direction of motion of the pusher of approximately thirty (30) degrees within certain limits. The leading arm of the pocket intersects the blade preferably at an angle slightly less than ninety (90) degrees. The trailing arm of the pocket intersects the blade preferably at a small angle.

The particular shape, structure and arrangement of the pusher and the blade array provide a means whereby the previously experienced problems in simultaneously slicing a tomato into many slices have been obviated. Previous problems include crushing or mangling of the fruit and may also have included the problem of having the fruit slide on the blade rather than be cleanly cut by it. The exact way in which each of the preferable relationships affects the desired clean and non-bruising slicing of a tomato is described in more detail below in connection with the detailed structure and operation of the apparatus.

Brief description of the drawing

FIGURE 1 is a plan view, partially fragmented, of the soft fruit slicing apparatus;

FIGURE 2 is a side view, partially fragmented of the apparatus; and

FIGURE 3 is a cross-sectional view taken along line 3—3 of FIGURE 1.

2

Description of the preferred embodiment

The invention is best understood in connection with the accompanying figures in which like reference numerals refer to like parts. The soft fruit slicing apparatus is generally designated 100. A generally rectangular base 10 is provided. The base 10 has a generally planar upper surface, generally solid except as described below. It is generally hollow. As shown, the base 10 has a general appearance of an inverted rectangular pan.

The base supports on its upper surface an array of blades. The structure of the blade array or assembly is best initially considered in connection with FIGURE 2. A pair of pedestals or vertical supports 22 are provided extending upwardly from the base. They are affixed to the base by spot welds. The two pedestals are positioned on the upper surface of the base substantially near two diagonally opposed corners. The two pedestals 22 are connected at their upper ends by means of a bridge 26. Bridge 26 serves the function of a blade, and also has the function of bracing apart the two pedestals against the tension stress due to the blades, as is described below. A further subsidiary function of bridge 26 is as a convenient and safe hand rest for the operator during the operation of the apparatus. The pedestals 22 and the bridge 26 are preferably and conveniently made of heavy gauge sheet metal bent so as to form channel members.

Each pedestal 22 has affixed to it a blade retainer 23. The blade retainer 23 is a vertically oriented block of metal, generally of rectangular cross section. These retainers 23 are positioned on their respective pedestals 22 so that they oppose and face each other. Each blade retainer 23 is provided with a plurality of spaced apart horizontal parallel slots, as best shown at the left side of FIGURE 2. These slots extend into the body of the retainer from the side thereof facing the opposed retainer, and do not pass all the way through the body of the retainer. Each slot accommodates the end of a blade 24. Each blade 24 is retained in its slot in each of the opposed blade retainers 23 by means of a vertical pin 25 running through each of the blade retainers 23. A vertical hole to accommodate pin 25 is provided through the center of each of the blade retainers 23. Likewise, a hole is provided near each end of each blade 24. The holes in the retainers and blade ends are so positioned that when each blade 24 is inserted in place as shown, all the holes of one end of all the blades register with the vertical hole through the blade retainer 23 so that pin 25 passes therethrough. The position and structure of pin 25 is best shown at the left hand portion of FIGURE 1, where it is shown below the broken away fragmented portion of bridge 26. This showing at the lower left hand corner of FIGURE 1 of course indicates the position of the corresponding holes in the retainer 23 and the blades 24. An identical structure is provided at the other end, that is, at the upper right hand corner of FIGURE 1.

Each blade is approximately eleven (11) inches long from hole to hole, approximately one-quarter (¼) inch wide, and approximately ten one thousandths (.010") inch thick. Thus, each blade is thin and vertically somewhat flexible, although unyielding in a horizontal direction. The blades are shown proportionally thicker in FIGURE 2 for ease of showing. The relative thinness of the blades, on the dimensional order as described above is preferable. It provides less beam strength than

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a thicker blade would, but it has the advantage of displacing less volume of the tomato, or other fruit object which is passing it. It has been found that this low displacement is important in making the clean cut as desired of an object such as a tomato. The provision of a plurality of such disposed blades for simultaneous cutting is an important aspect of the invention, but the exact number or spacing is subject to reasonable variation. Thus, a preferred form has one quarter (¼) inch spacing between the blades and a total of fifteen (15) blades. Less blades are drawn in FIGURE 2 for ease of showing. Other suitable spacings between the blades include three sixteenths (3/16) inch, three eights (⅜) inch and one half (½) inch. The edge of the blades 24 initially contacted by the object to be cut are sharpened to knife edges, but are not serrated. Serrations have been found to mangle soft fruits or vegetables, particularly tomatoes, which is the specific field of interest of this invention.

The pedestals 22 are affixed to the upper surface of base 10 so that each of the blades 24 is in enough tension to prevent any noticeable or substantial sag in the middle. That is, enough tension is exerted so that to the naked eye, the blades all appear to be substantially horizontal and parallel. The cumulative tension, and the additional stresses when an object is being cut, are one of the requirements for the provision of bridge 26 as has been described above.

The other major element of the apparatus is the pusher assembly. It includes a handle and a pusher. A horizontal longitudinally extended handle generally designated 30 is provided. A grip or knob 33 is affixed to the outer end of this handle. The operator grasps the grip 33 for operation of the apparatus. The handle includes a horizontal portion 31*a* and an upwardly extending vertical portion 31*b*. The vertical portion 31*b* is provided at the inward end of the handle 30, that is, at the end remote from the grip 33.

The handle is horizontally slidably movable with respect to the base and parallel to the long edge of the base. An aperture 10*c* is provided in base 10 in a side thereof closely adjacent the upper surface. This aperture 10*c* accommodates the horizontal portion 31*a* of handle 30. The means for providing the sliding motion is best shown in FIGURE 3. Handle guides 35 are provided affixed to base 10 to the bottom of the upper surface thereof, as shown. These guides 35 serve the function of providing an extended passage and a supporting rail below the horizontal portion 31*a* of the handle. The guides 35 may actually be a unitary member with a central slot extending in a longitudinal direction.

It is also necessary to permit the sliding motion that an aperture 10*b* be provided to permit the movement of the vertical portion 31*a*. This aperture 10*a* is provided in the upper surface of base 10.

The pusher or guide is generally designated 34. Viewed from above is a generally Y-shaped structure, and this horizontal plane shape is carried throughout the vertical extent of the pusher 34. It is affixed to the vertical portion 31*b* of handle 30 by means of studs or bolts 32 which attach vertical portion 31*b* to the base of what may be termed the stem portion of the pusher 34. The pusher also includes arms 34*a*. These are best shown in FIGURE 1 and they branch out from the stem portion.

As best shown in FIGURE 2, both arm portions 34*a* and part of the stem portion are provided with a plurality of spaced horizontal pusher slots 34*b*. As shown in FIGURE 2, the height of the pusher 34 is equal to the vertical height of the array of blades 24, and one of the pusher slots 34*b* is provided to register with each of the blades 24. The pusher is preferably made of a strong hard plastic. It has been found that a polycarbonate resin, a thermoplastic material, is satisfactory. A suitable such resin is that sold under the trademark Lexan of the General Electric Co. In FIGURE 1, part of the top of the pusher 34 is fragmented away at the stem portion to show the

extent to which the pusher slots 34*b* extend into the stem portion.

It is apparent that the pusher assembly may be moved by pushing the slidable handle 30 until the pusher 34 has passed through and into the blades 24 to the point where the blades meet the limit of the pusher slots 34*b*. It is also apparent that the pusher assembly may be withdrawn to the right, as shown in FIGURES 1 and 2, so that a tomato 40, considered as the typical and preferred object to be sliced, may be placed within the ambit of the pusher arms 34*a*. As best shown in FIGURE 1, the pusher arms join in a smoothly rounded fillet, and the curvilinear portion of the arms and their joint is termed the pocket of the pusher. The tomato 40 is placed on the upper surface of the base 10 in the pocket of the pusher 34. As shown in FIGURE 1, the pusher assembly has been partly moved from right to left so that there is a sliced portion 40*b* and an unsliced portion 40*a* of the tomato. The pusher assembly can be retracted to the right so that the entire tomato 40 may be placed within the pocket of the pusher arm 34 without interfering with the blades.

It is highly preferable to observe several geographical relationships between certain of the parts in order to achieve consistent usefulness in slicing tomatoes. There must be a certain amount of movement of the tomato in the direction of the blade rather than a direct pushing into the blade, to provide a slicing type of cutting action. A direct perpendicular contact of the tomato and the blade edge tends to bruise or mangle the tomato and in general be unsatisfactory. The preferred angle between the direction of travel of the pusher assembly and the length of the blades is thirty (30) degrees. A number of different angles have been tried, and it has been found that the preferable range is within ten (10) degrees on either side of this preferred angle. If the angle is greater than that, there is an insufficient slicing effect and the tomato tends to be damaged. If the angle is less, the slicing effect is satisfactory, but the length of the blades would necessarily have to be increased, and the limiting factor in this direction is the loss of beam strength and the loss of stability of alignment of the blades since they would have a long carry with no re-enforcement. Thus, the limitation against a smaller angle is one of engineering and the limitation against the larger angle is one of function.

The arm 34*a* shown partly through the blade array in FIGURE 1 is the arm of the pusher 34 that enters the blade array first and is referred to as the leading arm. The other arm is called the trailing arm. The angle between the straight portion of the leading arm and the cutting edge of the blades 24 is highly preferable to be slightly less than ninety (90) degrees. A preferred angle has been found to be approximately eighty-seven (87) degrees, and while an absolutely exact limitation cannot critically be established, it can be said that this angle should be more than approximately eighty (80) degrees and less than ninety (90) degrees. The reason is that if this angle is ninety (90) degrees or more, there is tendency to push the tomato along the blades too much rather than to force them into the blades. Such a situation tends to squash, bruise, and otherwise damage the tomato against the blades rather than encouraging the blades to take a smooth entering bite.

It is also highly preferable that a straight portion of the trailing arm of the pusher 34, seen horizontally, be not exactly parallel to the length of the blade 24. The trailing arm makes a small acute angle with the blades, with the apex of the measured angle being toward the pocket end of the arm. This angle insures that the tomato is fully pushed through the blades to the other side. Another and important reason for this angle is to prevent the tomato from tending to roll or be forced backward in a direction along the length of the blades, as the end of the push approaches. That is, it prevents the tomato from tending to slide in a reverse direction from its direction

during the major portion of the cut. Such an effect, if not avoided, also tends to mangle the tomato.

It might be thought that the simultaneous multiple slicing of a tomato would not present problems which would require such specific developments, but the tomato presents a frustrating combination of softness and tough skin which does produce the problems which the present invention solves.

Most of the parts of the apparatus 100 are preferably made of heavy gauge bent sheet metal, although other materials and methods of forming may be used. The grip 33 and the pusher 34 are preferably of plastic, although other materials may be used. The base 10 may have distinct legs rather than sides coming down all around to form an apron effect. Rubber feet or suction cups may be provided at the bottom of the base. It has been found desirable to provide interior bracing within the base 10, and an X-frame running from corner to corner close to the upper surface has been found a desirable bracing feature.

The geometrical relationships as described have been obtained in the preferred embodiment by making the angle of separation between the straight portions of the leading and trailing arms 34*a* greater than ninety (90) degrees, approximately one hundred ten (110) degrees, and by slightly skewing the mounting of the pusher 34 on the vertical portion 31*b* of the handle. The base of the stem portion of the pusher 34 is not cut perpendicular to the sides of the stem portion, but at an approximate five (5) degree bias, tending to rotate the pusher that amount in the direction of the leading arm.

The scope of this invention is to be determined by the appended claims and not limited to the foregoing description and drawing which are illustrative.

I claim:

1. A tomato slicer comprising a base, an array of blades extending vertically above said base and including a plurality of thin blades with sharp cutting edges in spaced relationship, a pusher assembly mounted on said base, and means to move said pusher assembly and said blades relative to each other in a path of movement, said pusher assembly including a pusher having a leading arm and a trailing arm, said pusher arms forming a tomato holding pocket and having a plurality of slots therein, each slot for reception of a blade of said blade array when said pusher and said blade array are moved relative to each other, said blade array being disposed with respect to said path of movement such that said blade array lies at an angle less than forty (40) degrees with respect to said pusher path of movement, the angle of separation between said pusher leading arm and trailing arm being greater than 90°, the angle between said leading arm and the cutting edge of said blades being less than 90° with the trailing arm of said pusher making a small acute angle with respect to said cutting edge, said last two angles both opening toward the pocket of said pusher, whereby said pusher assembly achieves a smooth shearing action with a tomato urged against and through said blades to secure a plurality of thin tomato slices, essentially undamaged, with said tomato holding pocket slots allowing said blades to pass through the tomato.

2. The invention of claim 1 wherein said pusher assembly is movable and said array of blades is fixed, with said pusher assembly being moved toward and into said blade array in a generally rectilinear path of movement, said blade array lying at an angle ranging approximately between 20° and 40° with respect to said pusher path of movement, the angle between said leading arm and the cutting edge of said blades being less than 90° and at least approximately 80°.

3. The invention of claim 2 wherein the angle of separation between said pusher leading arm and trailing arm is 110°.

4. The invention of claim 3 wherein the angle between said leading arm and said cutting edge is 87°.

5. The invention of claim 4 wherein the angle between said blade array and said path of movement is 30°.

6. A soft fruit and vegetable slicer comprising

(a) a base,

(b) an array of blades on said base, said array being stationary and including a plurality of substantially horizontal parallel elongated flexible thin blades with non-serrated edges in spaced relationship one above the other,

(c) a pusher assembly mounted on said base, means to provide horizontal rectilinear sliding motion of said pusher assembly with respect to said blade array,

(d) a pusher included in said pusher assembly, said pusher comprising a leading arm, a trailing arm, and a stem portion, said arms and said stem portion being joined together to form a curvilinear pocket, said pusher having a plurality of slots therein, one such slot being provided for each blade in said blade array and in vertical registration with each said corresponding blade,

(e) the direction of the elongation of all said elongated blades in said blade array and the direction of said rectilinear sliding motion being an acute angle in a horizontal plane,

(f) the direction of elongation of said elongated blades with respect to the direction of said rectilinear sliding motion being less than approximately 40°,

(g) the limit of said rectilinear sliding motion being such that said pusher assembly has a withdrawn position in which said leading arm is at least partly withdrawn from said blade array, and a forward position in which said arm has substantially passed said blade array and said trailing arm has at least closely approached said blade array, the angle between sid leading arm and the direction of said elongated blades in said blade array being less than 90°, and said trailing arm making a small acute angle with the direction of said elongated blades, said angle between said leading arm and the direction of said blades, as well as said small acute angle both opening toward the pocket of said pusher.

7. A soft fruit and vegetable slicer as set forth in claim 6 wherein the angle between the direction of said rectilinear sliding motion and the direction of the elongation of said elongated blades is between approximately 20° and 40°.

8. A tomato slicer comprising a base, an array of blades extending vertically above said base and including a plurality of thin blades with sharp cutting edges in spaced relationship, a pusher assembly mounted on said base, and means to move said pusher assembly and said blades relative to each other in a path of movement, said pusher assembly including a pusher having a leading arm and a trailing arm, said pusher arms forming a tomato holding pocket and having a plurality of slots therein, each slot for reception of a blade of said blade array when said pusher and said blade array are moved relative to each other, said blade array being disposed with respect to said path of movement such that said blade array lies at an angle less than 40° with respect to said pusher path of movement, the angle of separation between said pusher leading arm and trailing arm being greater than 90°, the angle between said leading arm and the cutting edge of said blades being less than 90° with the trailing arm of said pusher making a small acute angle with respect to said cutting edge, said last two-named angles both opening toward the pocket of said pusher, whereby said pusher assembly achieves a smooth shearing action with a tomato urged against and through said blades to secure a plurality of thin tomato slices, essentially undamaged, with said tomato holding pocket slots allowing said blades to pass through the tomato.

9. The invention of claim 8 wherein the angle between said blade array and said path of movement is 30°, the

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angle of separation between said gripper leading arm and trailing arm is 110° and the angle between said leading arm and said cutting edge is 87°.

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W. GRAYDON ABERCROMBIE, *Primary Examiner.*

TOMATO KING SLICER MODEL TK-II

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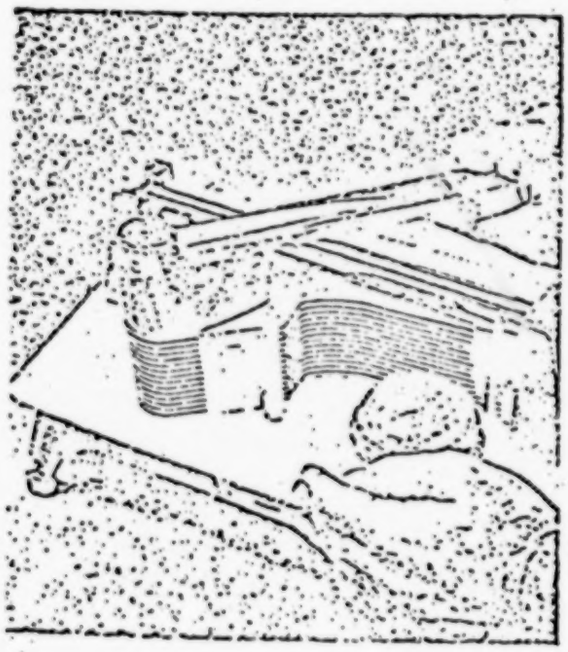

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